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THE FORESTER.

VOL. VII. JULY, 1901. No. 7.

THE BIG BASIN REDWOOD PARK.

BY DR. WILLIAM RUSSEL DUDLEY,

Professor of Botany in Stanford University.

ON the 16th of March, 1901, a bill appropriating $250,000 from the California State Treasury for the purchase of Redwood timber land in the Santa Cruz Mountains for public park purposes was signed by Governor Gage and became a law. The proposed park is on the peninsula which terminates at San Francisco, and is but 36 miles from that city in a direct line, about 16 miles from Leland Stanford Jr. University, 20 miles from San José, and 18 miles from Santa Cruz, which points are respectively north, northeast and southwest of the forest park. The above sum is made payable in five annual installments of $50,000 each, beginning with January 1, 1902, and is to be used by the Special Commission, solely for the purchase of land suitable for a Redwood Park. The Commission consists of the Governor of California, *ex-officio*, Chairman, and four other gentlemen appointed by him. They have power to purchase or condemn property required; they have full control of the selection of land, the payment of moneys and the formulation of rules and regulations governing the park. An option was obtained beforehand in the name of certain citizens acting in the interests of the State on the most valuable tract—about 2,300 acres—of uncut timber in the so-called Big Basin, the center of the region desired for a park; the continuation of this option being based on the favorable action of the State Legislature.

It would appear therefore that the campaign for the salvation of a portion of the marvelous Redwood forest of the Pacific Coast of California, openly began May 1, 1900, here at Stanford University, by a meeting of prominent citizens of San José, Santa Clara, Santa Cruz, and the two larger universities, cannot fail of reasonable success; and it is believed that such a public sentiment has been created that not only the 3,000 to 5,000 acres of the best Redwood land of the Basin can be secured through the appropriation, but much lagrer tracts can be added through private subscription and otherwise, before many years. But it must be remembered that the passage of the bill and the purchase of a few thousand acres is but the first stage in the park proposition. We know the ground pretty thoroughly, and we shall not rest content until the major part of a wilderness, 30,000 to 50,000 acres in extent which covers the Big Basin region, and is still largely unspoiled, is secured as a public park for recreation, and for the preservation of the Redwoods and the game and fish of the mountains of this peninsula.

Nevertheless, the appropriation of a quarter of a million dollars for such a purpose, is entirely a new departure not only in the history of California but in

that of any State west of the Mississippi; and I doubt not it will mark the administration of Governor Gage as the worthiest since the days of the Civil War. In any event the matter concerns the forests sufficiently to warrant a brief review in this article, of the character of the park, the history of the movement, the factors entering into it and the causes finally deciding the passage of the bill.

Santa Cruz County and other localities." This is the dictum of Henry Gannett in the "National Geographic Magazine" in 1899; and Sargent in the "Silva of North America," Vol. 10, says the species is "comparatively rare and usually small south of San Francisco." These remarks would correctly apply to the Redwoods south of Monterey, but they quite fail to give the right impression of the original of

Courtesy Bureau of Forestry.

A REDWOOD TREE.

It is the custom to refer to the natural distribution of the Redwoods (*Sequoia sempervirens*), as terminating near the mouth of the Russian River, some fifty miles north of San Francisco, with only "scattering groves south of the city in the cañons of the Santa Cruz mountains, where there are a considerable number of trees and stumps as large or even larger in girth than any I have been able to discover in Humboldt County. Moreover in the Big Basin and Pecadero forests of

these mountains the trees will average up about as large as in the north. I am sure, however, the trees in the north, in the bottomlands are often considerably taller than any of the original growth south of San Francisco. In 1899 I measured a Redwood in Mendecono County recently uprooted, which was 340 feet, possibly more, as the upper ten to twenty feet were much shattered. Professor Sargent measured one of equal height; and one who has seen them can readily believe that calculations concerning the extremely tall trees along the Eel River, Humboldt County, making them over 400 feet, are correct. The best forests of the north are nearly pure Redwoods, no other tree, not even *Pseudokuja*, growing among them. The trees grow close together in sheltered situations, hence there is the greatest stimulus toward the lightest possible altitude. In the Big Basin forest the trees are not as near together on the average, numerous Tan-bark Oaks, Madrones, and Spruce being interspersed. Hence a lesser height but a greater girth proportionally. The following trees which I have personally measured, were within one-fourth of a mile of one another in the middle of the tract on which the State hopes to purchase.

	50 Feet Above Ground.	At the Ground.
1.	59 feet circ.	100 feet circ.
2.	50¼ feet circ.	71 " "
3.	50 " "	
4.	42 " "	

I have on record several others in these woods measuring about 50 feet in circumference, five feet from the ground, while 32 to 42 feet is a frequent girth, according to my notes. The large trees, "General Fremont," at the Felton Grove above Santa Cruz, is said to be "sixty feet in circumference" but a high iron fence is built around it and verification of the measurement is always denied. The largest tree I have been able to learn about in the Santa Cruz Mountains was one (no longer standing) in White House Cañon, between the Big Basin and the Ocean. Mr. J. M. Manly, who has long resided near there, sent me a photograph of the stump which appears to be about ten or twelve feet in height, and which he says is "twenty-five feet across," although destitute of bark. I infer from his phraseology that the measurement is taken from the top of the stump. It spreads but little on approaching the ground, and it is certain that its measurement is considerably over twenty feet five feet from the ground. I shall soon visit this great relic of the steel age in California, and ascertain its proportions more fully. These facts show that we have Redwood trees of the very first class in the Santa Cruz Mountains. From inquiry and a limited number of measurements along the Eel River, in the northern forests, I found trees above twenty feet in diameter were very rare.

The peninsula extending from Santa Cruz to San Francisco lies between the ocean, the Golden Gate, San Francisco Bay, and a line running from the head of the bay through the middle of the broad, fertile Santa Clara Valley to the Pajaro River below Gilroy, thence following that river to Monterey Bay. The greatest length and breadth of this area are respectively 87 and 30 miles. It includes all of San Francisco, San Mateo, and Santa Cruz counties and over one-third of Santa Clara County. It contains three distinct mountain ranges, Sierra Azul, nearest the Santa Clara Valley on the east, Sierra Morena, next southwest, and the third, Ben Lomond, a shorter range or ridge parallel to the Sierra Morena, but some 8 to 10 miles from it, and near the Ocean, northwest of Santa Cruz. The first range is the highest, much of it lying above 3,000 feet, and culminating in Loma Prieta, 3,790 feet; but it does not extend half the length of the peninsula. It has absolutely no forests, but is essentially a chaparral-covered, blue range. The Sierra Morena practically extends from the Lake Merced depression,—a few miles below San Francisco,—to the southern end of the peninsula. In its southern half it approaches very closely the parallel Sierra Azul, but is nowhere so high, its highest point, Castle Rock, being 3,269

feet. It is neverthless the dividing ridge between the waters flowing toward the Pacific and those coming toward the Santa Clara Valley, and the Bay, and is the great bar against the eastward drift of the ocean fogs of spring, summer, and autumn. It had Redwoods in considerable bodies on both slopes along the streams, and interruptedly upon its summit. Usually the ridges between ravines are bare and grassy.

southwest of San José, however, in the Skyland region, are many small and very fruitful orchards and vineyards on the top of the mountain.

The subordinate range, Ben Lomond, extending nearly 20 miles northwest of Santa Cruz, rises from 1,000 to nearly 3,000 feet—no mean elevation, considering its proximity to the ocean—and having a granite and limestone core, it is important in extending the peninsula west.

Courtesy Bureau of Forestry.

A REDWOOD FLAT, WHERE NO LUMBERING HAS BEEN DONE.

The Redwoods, which begin at the Pajaro River on the south, nearly at sea-level, cease some twenty-five miles south of San Francisco although the range continues at an elevation of from 1,500 to 2,000 feet for ten miles farther, and receives abundant precipitation. The Santa Clara Valley and the foot-hills between it and the Sierra Morena are populous and often highly cultivated, but the range itself has but few ranches, and has many wild and wooded cañons. South and

ward, greatly increasing the forest area, while it does not intercept the fogs or rain-clouds rolling into the cañons between it and the Sierra Morena, or the main range.

Indeed, whatever there is of real forest and wilderness in our peninsular mountains, including the very existence of the Big Basin itself, is due to the presence of this outer range of Ben Lomond and its attendant spurs. Between it and the Sierra Morena lie two basins, that of the

San Lorenzo with Boulder Creek and other tributaries, draining southeastwardly to Monterey Bay; and that of Pescadero Creek, flowing northwest and running into the Pacific. The former, once covered with a dense forest of *Sequoia*, is now almost denuded and desolate; the latter has fared better and has lost but a few sections of its primitive woods. The larger portion of Ben Lomond is stock range, ranch and vineyard; but from its northern face and from the western slope of the Pescadero escarpment, a spur that is topographically a continuation of Ben Lomond, and forms the western and southern wall of the Pescadero basin, flow four streams to the Pacific, in the cañons of which existed a heavy growth of Redwood, separated by ridges densely clothed with inferior woods or with chaparral. Here are the Little Basin on Scott's Creek, the Big Basin on Waddell Creek, the basin of the Gazos and that of the Butano. Considering this as a forested region, one should extend it to include much of the Pescadero basin on the north, when we have a continuous tract of wilderness unbroken by pasture, ranch or road, penetrated by a few trails only, most of which have fought unavailingly against the rapidly growing undergrowth —a tract twelve miles by eight, roughly estimating, the center of the heaviest rainfall in this part of the State, with impenetrable vegetation of almost tropical luxuriance, high ridges, deep ravines, rippling trout-streams, rocks, crags, and the safest of deer cover.

Courtesy Bureau of Forestry.

A NEARER VIEW OF THE SAME FOREST.

At Kings or elsewhere on the Sierra Morena there are ravines or slopes of woods to admire, but the elevation, the distant view of ocean, bay and valley are the chief attractions, and one has no sense of trackless forest, or the "boundless contiguity of shade." In the Big Basin region, on the contrary, one feels himself

invested at once with the gentle, solemn, illimitable influence of the "high woods,' as the people of the tropics term their primeval wilderness. Even if you ascend the summit of some chaparraled ridge, the sunlight may be warmer, and the air freer, but the feeling of the wilderness prevails. It cannot be otherwise when one sees scarcely an acre of grassy land in view; only the brushy ridges dusky olive in color, dividing well-sheltered basins of the greener spire-topped Redwoods, all silent and sleeping, as becomes a wilderness, in the sunlight of high noon, and sloping somewhat gently toward a lonely ocean relieved by no sign of sail.

Since the beginning of the movement, three possible dimensions of the proposed park have been recognized:

First.—That of the Big Basin proper, which is limited to the watershed of Waddell Creek and its several branches. Its area is from 14,000 to 18,000 acres, according as one takes in more or less of the adjacent ridges and "chalk hills"; it includes the cut-over sections near the

Courtesy Bureau of Forestry.

TEN FOOT STUMP ON TEN FOOT WINDFALL. THE WINDFALL IS SOUND THOUGH RINGS ON THE STUMP SHOW IT TO HAVE LAIN THERE AT LEAST SIX HUNDRED YEARS.

Union mill, on the eastern border, and extends by a narrow valley to the ocean on the southwest. In this lies the choicest timber remaining in the Santa Cruz Mountains, including the tract of beautiful slope and bottom-land on the Waddell, of over 2,000 acres in extent; for the purchase of which the State has recently appropriated money. This tract was sold to a lumberman, who would have begun cutting last November, but for the efforts of determined friends of the park. An option on the tract was secured by the latter and an agreement entered into at Stanford University to postpone any further cutting until the matter could be brought before the Legislature. The bill recently passed to purchase this tract for the State saved the situation. If we had lost this bill we would have lost the best Redwoods south of the Golden Gate, lost the heart of the Big Basin, and the key to any forest park that would have been adequate in character to the noblest of trees, which it was designed to preserve.

The second possible plan was the park of three valleys, including the Big Basin above mentioned on the Waddell, the basin of the Gazos Creek, and the Butano, with their dividing ridges; making a continuous tract of between 28,000 and 30,000 acres, about one-half lying in Santa Cruz county and one-half in San Mateo county. This is still largely a virgin forest and Redwoods cover or covered more than one-third of it. This tract has a mountain wall bounding it on the south, east and north, which has a remarkably good grade for a road. On this high escarpment, a boulevard might be laid out, running, on the east wall, six or eight miles, on almost an even grade of 2,000 feet, with a magnificent outlook over the forest, ravine, and ocean below. On swinging round to the west, on the ridge between the Butano and the Pescadero, the grade soon sinks to 1,000 feet, along which it runs five or six miles further, when it breaks down toward the mesa and bottom-land about Pescadero village. These are some of the desirable lines along which our mountain park could be established; and, if the narrow valley of Scott's Creek—the "Little Basin," now partly cut over—were included, thus extending the reservation south to the high escarpment of Ben Lomond on the south, the whole would seem designed by nature as a place walled in for the protection of the great Redwoods and a recreation ground for our fast increasing population.

The third proposition is a park of five valleys, or basins, and includes, besides the four above named, Pescadero on the north and northeast. Its dimensions would fall not far short of 50,000 acres. If this third plan were ever carried out, no doubt the people of Santa Cruz would petition to have the now denuded portions of Boulder Creek and the upper San Lorenzo river purchased, reforested, and set aside as a protection of a valuable supply of mountain water and second-growth timber. This, with the adjoining five-valley park, would make a block of forest of some 75,000 acres, covering land of small agricultural value, but of untold recreative and economic value to the rich agricultural and commercial districts not far distant.

This area of continuous forest is one of remarkable variety, beauty and luxuriance for an evergreen woods, and æsthetically, is in strong contrast to the Redwoods of Humboldt county. In the Big Basin the Redwood is dominant, but the Douglas Spruce, the Madrone, and the Tan-bark Oak are frequent, and the Box-leaf Huckleberry, one of the handsomest of evergreens is the common undershrub. The Spruce rivals the Redwood in height, its foliage is fine and, soft; the bark of Madrone is reddish, its leaves are magnolia-like and some of them turn yellow and crimson in the summer and autumn; the Tan-bark Oak has slender branches which seem to climb or droop after the manner of a vine. Then along the streams are the Azaleas, full of flower in June, in November, with the great white stemmed Alders, they shed their yellowing leaves and give the true autumnal aspect to the places where the trail fords the stream. One remembers the Basin as a half-tropical jungle, with much sunlight filtering into it. Undoubtedly this effect is increased by the occasional presence of

small, grassy openings, like deer pastures in the forest, and by the presence of many seedling Redwoods and Spruce.

In the northern Redwoods all these trees which lend variety and beauty to the Big Basin are largely wanting. The Redwood stands alone. In places the sun never shines, and the woods have the solemnity of a temple. It will be the greatest mistake northwestern California can make if she does not preserve the Bull Creek Redwoods along the south fork of the Eel River.

For a long time there will be something of mystery about the Basin region. In some way its topography occasions a considerably greater precipitation than on the ocean shore or at any point farther inland. To this, combined with large total of heat, is probably due the tropical luxuriance and forested aspect of this section. The normal average annual rainfall at Boulder Creek, a point within this forest, is computed by the Weather Bureau as 63.76 inches. As you pass in any direction away from this tract the rainfall rapidly decreases and simultaneously the forest becomes at first discontinuous, then ceases altogether.

The following table, based on as authentic reports as are to be obtained, is most instructive:

Station.	Situation.	Av. Ann. Precipitation.
Boulder Creek.	In the Big Basin Region.	63.76
Santa Cruz.	18 miles south on sea coast.	26.67
San José.	20 miles N. E.	14.52
Stanford Univ.	16 miles north.	15.96
San Francisco.	36 miles north.	23.60
Tracy.	57 miles east in San Jaquin Valley.	10.06
Eureka.	In northern Redwood district.	45.54
Crescent City.	In northern Redwood district.	70.39

THE SOUTHERN APPALACHIANS FROM THE LUMBERMAN'S STANDPOINT.

H. B. Ayres.

U. S. Geological Survey.

In topography, geology, and in forest, the Appalachian Range is remarkably uniform, though varying so much in latitude. In northern Georgia or northern South Carolina, one, judging by his surroundings of forest and scenery, or by the rocks he may sample, might easily imagine himself at almost any point along the range, even to northern New Jersey.

The rocks determine the configuration of the mountains. Once horizontal, these beds in very ancient geologic time were squeezed and wrinkled up, by pressure from the northwest and southwest, until they are now standing nearly on edge. Since the uplift, erosion has been at work. South of the glaciated region, as this is, the rock unprotected by glacial debris, near the surface, has decomposed in places, often to a depth of many feet (sometimes fifty or more). In the courses of streams this decomposed material has been washed away, but away from the streams, wherever protected from erosion, this material remains undisturbed. The general result has been the baring of hard beds of rocks which have formed the summits of peaks, the walls of cañons, long, smooth slopes in beds of streams, or cliffs over which the streams fall in cascades. The intervening portions, though often very steep, are seldom very rocky.

The general course of the larger streams is usually northwest or southeast, that is, directly across the bedding of the rock.

The tributaries of these streams commonly come out from between the parallel mountain ridges, formed by the harder layers of rock which have resisted erosion. Their valleys are narrow with steep slopes. About the heads of these tributaries are the fan-shaped basins, or amphitheaters, locally called coves, which extend to the mountain crests fluted by the erosion of small streams which join at the lowest point of the cove.

The rivers are often broad and shallow, with frequent bars of rock reaching entirely across them, often forming natural dams, across which in low water, one may wade without serious difficulty. These bars of rock are especially troublesome in floating or rafting logs. The rivers seldom have high falls, but they are too rough to be navigable within the tract examined. The lateral tributaries are both rapid and rocky, usually full of bowlders, in passing which the stream is divided into narrow and crooked channels. There is usually no chance at all to float logs in such streams without enormous expense in blasting out rock, and even then new bowlders may be moved in by the next freshet. Near the mouths of these tributaries there are often favorable locations for dams, but elsewhere there is usually great lack of flowage basins. The streams are rapid and subject to great floods, and their bottom-lands are narrow and often entirely wanting.

The coves have steep slopes, except at their lower ends, where there are usually several acres smooth enough to be arable.

This knowledge of topography is of great importance in the study of transportation,

A FOREST IN THE SOUTHERN APPALACHIAN MOUNTAINS, NORTH CAROLINA.

and transportation is a vital question here.

THE FOREST.

All of the surface has been wooded, except a few of the highest summits, which are grassed, and the cliffs of bare rock; some land has been cleared for farms, some of the forest has been deadened by fire or girdling, but nearly all the woodland has log timber of considerable value, if it were placed on the market. It is a hardwood forest, consisting principally of the Oaks, of which there are many species.

There are also Poplar, Cherry, Walnut, White Ash, Cucumber, Buckeye, Linn (these latter float fairly well), and a sprinkling of conifers, which, in order of abundance, are Hemlock, White Pine, Spruce, Pitch Pine, Shortleaf Pine, and the common Scrub Pine of the South. There are also large patches of the Southern Balsam on or near the higher summits. All the conifers are floatable.

The heaviest bodies of timber are in the coves, especially those exposed toward the north, where Poplar, Cherry, Ash, Linn and Walnut are found. The ridges are scantily timbered, usually with Oak or Chestnut, or, in the higher altitudes, with Spruce and Balsam, and the southern slopes show the effect of hot sun and fire in a light stock of defective timber, mostly Oak and Chestnut. The whole region except a few balds, has been, and most of it is yet, covered with log timber or small wood, all of which would be of considerable value in the market, and much of which, as the Poplar, Ash, Cherry, Walnut and the best quality of the Oaks, would bring a high price. Some of the most valuable timber grows where it is very difficult to get out.

The amount of log timber estimated on 6,663 square miles examined is 9,710,777,000 feet board measure, and of small wood, 57,826,040 cords. But most of this vast amount of excellent material is considered of no value where it stands.

CLEARINGS.

The many people who have gone into this great forest to make homes, have usually chosen the smoothest and most fertile land, the most accessible of such, of course, being first chosen. At present probably 90 per cent. of the arable land in the valleys has been cleared, while in the coves, even high on the mountain sides, are occasional small clearings, the location of which seems to have been determined, in many cases, by the price of land rather than its adaptability to farming.

Of the 6,663 square miles examined during the season of 1900 by Mr. Ashe and myself, about 1,220 have been cleared, and the population using this cleared land is approximately 194,800, or about 160 to the square mile of cleared land and 29 per square mile of the whole area. This however, includes the French Broad Valley, outside of which the population is much less dense.

THE PEOPLE.

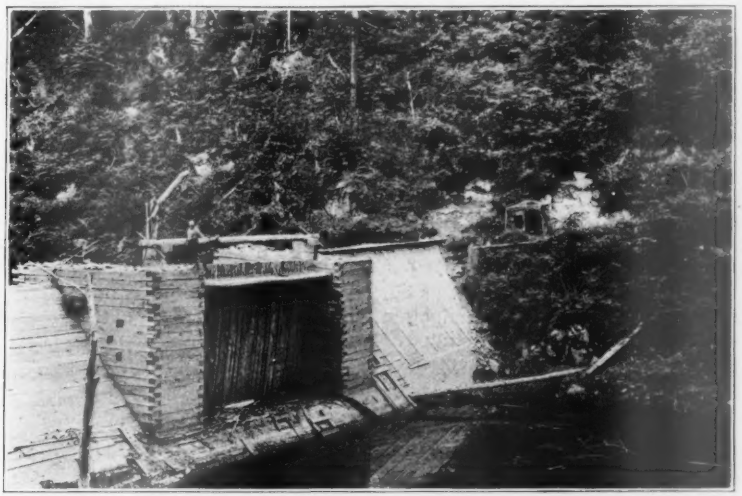
The habits and characteristics of the resident population must have considerable effect upon such an enterprise as lumbering, to be undertaken in this region, and a question of considerable importance is whether the hospitality and other admirable traits of these people, which are evident to passing strangers, are supplemented by the enduring qualities which would make them valuable as help, or as managers of logging operations.

The men are nearly all good axemen, expert woodsmen, and accustomed to handling logs, and many of them are very trusty. It is probable that careful selection and training would bring out a valuable lot of men. Many of these people have sterling principles under manners and customs that may seem peculiar to us.

CUSTOMARY LUMBERING.

The lumbering that has been done so far has been merely a desultory culling. Owing to the difficulty of access only the most valuable trees have been taken out. Two methods are in vogue. Under one they have been dragged or hauled from the mountains to small portable mills, and the sawed lumber has been hauled (sometimes 35 miles over horribly rough roads) by wagon to the railroad. Under the other the logs have been put in the larger streams and floated to large mills below. In either method moving the log from the stump to the mill is a difficult problem, and a great many devices have been used to facilitate the work. On smooth or gently sloping ground the matter is simple, unless the logs are very large (and here they are frequently six feet in diameter), but on the steep precipitous mountain sides, or in the narrow rocky gorges a great deal of engineering is necessary. The simplest form of dragway is merely a cleared path through the woods, pro-

tected where the logs are inclined to gouge into the ground, by poles bedded lengthwise in the trail. On side hills poles are placed along the lower side of the trail to prevent the log from rolling down hill. Where many heavy logs are to be dragged the rails. One little mule has been seen pulling one car with one log and three men, while one teamster might handle five or six mules and as many cars heavily loaded. Moving the logs from the stump to the dragway or tramway is usually done



Courtesy Bureau of Forestry.

A SPLASH DAM, MIDDLE FORK OF LITTLE RIVER.

long distances, dragways are made of two or more parallel logs forming a trough. In this trough the logs are moved by teams walking alongside. In very steep places chutes are sometimes used, in which the logs are moved by their gravity. Owing to the difficulty of keeping the logs in the chute and of stopping them without damage, the few trees taken and the cost of the chute, this method has been seldom used.

Horse tramways have recently come into use. These usually have a three-foot guage and the steepest grade noticed was said to be 20 per cent. The rails are made of wood, and are usually capped by strips of some specially hard or tough wood, such as Gum or Hard Maple. The narrow cars now in use seldom hold more than three logs, and, where very large, one log is often sufficient for a load. In moving these cars the mule or horse walks on planks between by oxen, and the difficulty of doing this can easily be imagined. A steam skidder was seen in operation on Balsam Mountain. The engine was brought up the mountain on a tramway and anchored on a spur. From the engine an endless wire cable was carried into the woods, sometimes 3,000 feet from the engine. At the terminal point a pulley was fixed to a tree. A short chain or cable with tongues attached the logs to the main cable at any point along the cable where the log might be. The log was then dragged along the ground to the tramway, where it was lifted by tongs directly upon the car. This process seems very well adapted to logging on the mountain sides, where logs can be pulled out of deep gorges with perfect ease. Logs are often hauled long distances on wagons over fearful roads to the mill, but usually a bunch or setting of

logs are twitched together in a cove near their stumps, and the mill is moved to them.

Where logs are floated to the mill "splash dams" are used to regulate the volume of water. These are placed where the most favorable flowage can be found, and, owing to the nature of the ground, must be high to hold much water. Owing to frequent heavy rains, they are very liable to be washed out. The rapid and rocky streams, even with the best reservoirs, are hard to drive, the logs are frequently lodged, and those that do get through are broomed and splintered, and the ends are often full of rock. This practice is objected to by the population in the valleys below. There are few bridges, and the rivers are crossed by fording. When a "splash is on" they are impassable. The fords are dangerous during the rise or fall of the flood and besides, the flood often makes holes in or moves boulders into the ford. After the logs reach their intended stopping place, they are often carried right through the boom by the strong current, or, if held for a time, a sudden rise of the river is apt to carry them away, boom and all.

Some northern lumbermen, accustomed to clean cutting in pine and spruce forest, and to streams of moderate current rising in a glaciated region, where the flow is steadied by natural reservoirs, have made mistakes in their calculations when undertaking operations in this region; where the mountains are so difficult of access, the floatable logs in such small proportion, where the streams are so difficult to drive, and where they cannot haul either logs or lumber on sleds.

MINOR PRODUCTS.

Hemlock and chestnut oak tanbark have been used in small quantity. The prices have ranged from $3.00 to $5.00 per cord for hemlock, and $5.00 to $7.00 for chestnut oak. At these figures there is usually little or no profit. Some hemlock bark has been taken from very rough land and hauled 25 miles from Beech Mountain to Elk Park for $3.00 a cord. A large tannery has been recently established at Andrews, where chestnut oak bark is brought in from the surrounding hills. Some $40,000 was paid out for bark

Courtesy Bureau of Forestry.

POPLAR BUTTS LEFT IN LOGGING. DIAMETER 48 INCHES, THREE QUARTERS SOUND.

last year at Andrews. There are tanneries also at Hazelwood, Waynesville, Asheville, Morganton, Johnson City, Newport, Sevierville, and Maryville. There is a large amount of bark in this forest, but present prices and the difficulty of access make it unprofitable to handle. Locust pins and shingles are manufactured in most settlements. Pin blocks are split about 2½ inches square in the woods and hauled to the mills, where they are turned.

Shingles are manufactured for local use from Oak, Chestnut and Pine. These shingles are usually split by hand, for hand-made shingles command a considerably higher price than sawed shingles. Much waste of material is connected with their manufacture. In northern South Carolina, the shingles made of the heartwood of the *Pinus echinata* (Shortleaf Pine) are in special demand. The large straight-grained trees are cut down and sawed into shingle lengths, then all the sapwood is slabbed off, after which the shingles are rived from the heartwood. In this process only the heart of the clear and straight-grained butts can be used. The remainder of the tree, often containing much log timber, is left in the woods.

The collection of balsam pitch is made incidentally by mountaineers on their occasional trips to the summits. Cherry bark is sometimes collected for medicinal use, as also Snakeroot, Hellebore and Ginseng, but the collection of medicinal products is rather a small item.

Courtesy Bureau of Forestry.

DRAGWAY AND TRAMWAY, LITTLE SNOWBIRD CREEK.

There is no great industry in the whole area, the population of about 100,000 people in the mountain region are devoting their lives to killing horses trying to haul lumber over their miserable roads, killing themselves trying to grow crops on non-agricultural land, or to killing their neighbors.

Their amusements are chiefly hunting hogs and making "moonshine."

Their great resource lies undeveloped and wasting by fire and grazing, while labor brings so little return that all the family must work hard to supply ordinary comforts (women are commonly seen hoeing corn, weaving homespun or chopping wood).

Now what can be done?

The resources are there. How can they be used? I know no other region where the forest grows so rapidly, reproduces with valuable species so readily, or where it is so safe from fire. But under the present system or lack of system, the forest is almost worthless.

Some reliable system of cheap transportation must be found. The hardwood will not float and the streams are too rough and unreliable to carry softwoods which are in small proportion.

Notice the tendency toward railroad logging in the north, where logs are sometimes hauled 70 miles by rail, even with drivable streams at hand, and where all the timber will float. Railroading is to be the method in this region.

If accessible, the material now on this 6,663 square miles would, at a conservative estimate, be worth $97,000,000 (saying nothing of the future forest). Now to build roads through each square mile would require 6,663 miles of road. If this could be built for $10,000 per mile, $37,000,000 would be left for incidentals.

A study of the topography suggests the system of tracks. The main valleys should have substantial roads. The tributary valleys may be amply supplied by electric roads, having merely power enough to take empty or slightly loaded cars up the valleys. Loaded cars might return by gravity and even assist in taking loads up. Above the electric cars, tramways or monorailways would be the thing. These could be made as far as possible of portable material, and shifted from time to time as the land be cut over if clean cutting were decided upon. Steam skidders, in connection with the tramways, would be indispensable.

The location of mills and factories is a very important question. When logs are easily floated, they can be manufactured a long way from the stump. This method is adapted to regions destitute of agricultural land. In this region, however (like the Schwartzwald, as I understand it) small portions of the valleys are agricultural and well suited for town sites. Here mills and factories should be put up, distillation plants and pulp mills established.

The industries of such towns well up in the mountains would be supplemented by tourists and health seekers from the southern cities who would then find accommodations they now cannot secure.

A great increase in population and improvement over the present condition of the people would be one result of using the forest resource. At present, profitable employment is hard to find. If there were plenty else to do, much of the "moonshine" making would be abandoned, and less interest would be taken in feuds. The people could have schools, churches and social privileges they now lack.

In promoting the development and utilization of this forest region one can feel that he is doing something for humanity, and a progress that would seem incredible to some of these mountaineers seems possible to one who studies it.

This has been said concerning the natural and culled forest that is there now.

A great and profitable industry is possible in harvesting it, but the forester can make the resource perpetual, and if he were permitted to do this, the manufacturers could establish permanent instead of transient roads, mills and factories, and the people could afford to improve their property and make permanent homes.

REPRODUCTION OF TREES AND RANGE CATTLE.

By C. S. Crandall,
Bureau of Forestry.

In the mountains of Colorado, at low and middle altitudes, that is, from the foothills up to about 8,000 feet, are many slopes, saddles, and mountain tops entirely destitute of trees. There are also considerable areas covered with widely separated trees, the relics of destroyed forests, while in some of the

cañons that have been burned over few living trees remain.

Some of these barren or scantily covered areas have been in their present condition for a good many years, others have been more recently stripped of trees. All have resulted from the repeated action of destructive fires. They are remarkably free from young seedling trees and seem likely to remain as they are for an indefinite time.

GRAZING SCENE IN BIGHORN MOUNTAINS, WYOMING.

The standing bodies of normal forest lying between the treeless areas are almost always sharply defined in outline; the trees show no grading off in size on the borders, and there is usually no fringe of seedlings to indicated any encroachment upon the barren tracts.

The absence of seedling trees is a striking feature and the observer at once casts about for plausible reasons why young trees do not spring up. Examination of many localities shows some variations, and some exceptions to the conditions commonly prevailing, but two things are very soon decided upon as governing factors in the matter of seedings. These are climate and cattle.

The climate although varying somewhat with the seasons is always semi-arid; very small rainfall, clear skies, hot suns, and the consequent parching of unprotected vegetation, are prominent features. These conditions account in some measure for the scant reproduction, but can not alone be held responsible for the existing barrenness, because under certain conditions reproduction goes on, slowly perhaps, but

perceptibly, and areas become covered with trees under the same hot suns and the same small rainfall.

The conditions I refer to are such as are found when natural processes are in no way interfered with. On undisturbed areas plants are produced that thrive under exposure, and these grown to maturity afford lodgment for seeds and protection for the seedlings of other plants which in turn serve as nurses for tree seedlings, and thus, in time a new forest is formed.

But where the ranging of cattle is added to adverse climate the conditions soon become such as to effectually prevent the germination of seeds, and the development of seedings. The opinion is current in the region that cattle do no injury to forests, and so far as established trees are concerned this may be accepted as true, but I am convinced by observation that the constant ranging of cattle is a principal reason for the barren conditions existing on many large areas.

It has long been the custom of ranchmen living in the foothills or on the plains as well as of those living in the mountains to range their cattle in the mountains from the time grass starts in spring until late fall, and not infrequently cattle are left to care for themselves throughout the year. In later years many large tracts have been fenced, but whether fenced or open, there is very little of the region that is not grazed to the limit of its ability to support animal life. There are times in every season when vegetation is scanty and the cattle are constantly moving in search of food. Instead of lying down early in the day to ruminate as animals will when in good pasture, they are seen feeding at all hours, and never seem satisfied. Herbaceous vegetation is kept cropped to the roots, and shrubs are closely browsed. The soil becomes very compact under constant tramping and it is impossible for seedlings to start or for plants of any kind to grow.

Small, undisturbed areas, inaccessible or in some way protected, are here and there to be found; these appear in strong contrast with the grazed areas and serve to make prominent the results following the constant presence and persistent feeding of cattle.

A FOREST OF LODGEPOLE PINE IN A REGION USED FOR GRAZING.
BIGHORN FOREST RESERVE, WYOMING.

In the course of botanical collecting the writer visited one locality several times each season for several years. It is a fenced area covering about two sections, extending lengthwise in a narrow valley in which runs a small stream, and includes the tops of the bordering ranges of low mountains. The stream is bordered below with shrubs, deciduous trees — Cottonwood, Aspen, Thorn, Wild

Plum, Serviceberry, Maple, Alder, and a few small Pines; above is a forest of Yellow Pine of varying density. The mountain tops and a large part of the slopes, especially below, are destitute of trees.

When first visited and during the first two seasons it was ranged by a bunch of cattle, and in the fall of the second season presented a very barren appearance. Every foot of the open area was close cropped, shrubs broken down, and the ground everywhere well tramped over. The following winter the cattle were sold and for the two following seasons none were ranged within this enclosure.

The recovery of vegetation during the first season was very marked, and by the close of the second season the transformation was complete; grasses and other herbaceous plants became abundant, shrubs spread out and grew wonderfully and the whole aspect of the valley was changed. It can hardly be doubted that under the increasing protection of this cover of vegetation seedlings would obtain footing and extend the tree-covered area. The next season, however, cattle were again introduced and by fall the former barren aspect had returned.

The changes observed on this tract, occurring as they did under the action of a known cause, coupled with single observations made in other localities where there were plain evidences of similar changes, give strength to the opinion that the ranging of cattle over the mountains is one of the most important reasons why reproduction does not take place on the treeless areas.

VIEW OF AN OLD BURN IN BATTLEMENT MESA FOREST RESERVE, COLORADO. SHOWS REPRODUCTION OF FIR WHERE GRAZING IS PREVENTED BY FALLEN TIMBER.

Where reproduction follows the first burning of a forest, even after the lapse of several years, the seedlings have the protection of dead, fallen trees until they have passed the critical period and reached such size that they are less liable to in-

jury. It is the repeatedly burned tracts, swept clear of all vegetable matter that remain treeless. They become, in time, covered with grasses and other herbaceous plants, but where ranged by cattle vegetation can not advance beyond the first, or grass stage of recuperation.

On steep slopes the injury from grazing is especially great, because of the sliding incident to the steepness, and as every foot of ground is traversed in the search for stray clumps of grass, the animals not only check vegetation, but bring such slopes to a condition of barrenness from which recovery is very slow. Soil erosion follows in the tracks made and gullies are formed which continually grow worse.

The effects noted as following the ranging of cattle will naturally differ in different seasons and in different localities according as the number of cattle is increased or diminished, and the serious results are only observed where there is apparent overstocking. Where a range is overstocked the animals do not do well and it would seem business economy on the part of cattle owners to prevent overstocking. But the stockman hopes for rain and better grass, and seems satisfied if the animals live until he is ready to corral and feed them up for market.

The practice of ranging the mountains is long established and any proposition to restrict it in any way would meet with vigorous opposition. Over portions of the region there is, perhaps, no reason for suggesting restriction, except that a less number of animals would thrive better, but there are localities where additional forest cover is needed because of its influence upon the flow of water. The steep sides of cañons, the tops of some mountains, and all the slopes about the heads of many ravines need forest cover to prevent quick-forming floods and to better regulate the flow of water. Such localities should be protected from cattle so that natural processes may improve the forest conditions.

Ranging cattle in the mountains does not decrease the forest area, but it certainly does much to prevent increase and check restoration of forests on burned areas.

The question that overshadows all others is that of preventing further destruction by fire, but as secondary to this the influence on the forest of ranging cattle is important and worthy of thoughtful consideration.

FOR CONNECTICUT FORESTS.

THE checking of ruthful devastation of forests and the intelligent cultivation of the growth of valuable timber on barren lands, is expected to result from the recent bill passed by the legislature and which now awaits the signature of Governor McLean. While the bill provides for the expenditure of only $2,000 for this year's work, it is expected that with this sum quite a parcel of land may be purchased and planted and fenced, for the bill specifies that only $4 an acre shall be paid for the land, and that not more than $2.50 an acre shall be expended in the planting of seeds.

The bill names Pine, Oak and Chestnut as the most desirable trees for cultivation, and the work is to be entrusted to a state forester, who is to be appointed according to the dictates of Section 1, which specifies:

"The board of control of the Connecticut Agricultural Experiment station at New Haven, shall designate and appoint a man qualified by scientific training and practical experience to be state forester for the performance of his duties as prescribed in the act. The state forester shall have an office at the experiment station in New Haven, but shall receive no compensation other than his regular salary as a member of the station staff of deputies or aide as may be necessary."

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Announcement of Summer Meeting. The principal summer meeting of the American Forestry Association for 1901 will be held at Denver, Colorado, Tuesday, Wednesday and Thursday, August 27th–29th, in affiliation with the American Association for the Advancement of Science.

There will be two sessions daily, at 10 a. m. and 2:30 p. m., which will be held in the Denver High School building, and, in addition, an open evening meeting, in the Central Presbyterian Church, Wednesday, August 28th, at 8 p. m. At the latter meeting there will be short addresses by Hon. Thomas M. Patterson, Hon. Thomas F. Walsh, Hon. Platt Rogers, and others, followed by an illustrated lecture by Mr. Gifford Pinchot, Forester of the United States Department of Agriculture, entitled "The Government and the Forest Reserves."

This meeting will be a distinctively Western one, and its proceedings of special interest to all concerned with the forest problems before the Western States—fires, grazing, relation of forests to water supply, etc.

The address of welcome at the opening session, Tuesday, August 27th, 10:30 a. m., will be delivered by Hon. Thomas M. Patterson, United States Senate.

It is expected that the President of the Association, Hon. James Wilson, Secretary of Agriculture, will attend the meeting, and preside at one or more sessions.

A partial list of speakers at the meeting, and their subjects, follows:

Mr. A. L. Fellows, Denver, Col., "The Hydrography of Colorado"; Mr. Geo. B. Sudworth, Chief of Division of Forest Investigation, Bureau of Forestry, Washington, D. C., "Forests and Their Relation to Agriculture and Manufacturing Industries"; Mr. S. J. Holsinger, Phœnix, Arizona, "The Boundary Line between the Forest and the Desert"; Professor R. H. Forbes, Tucson, Arizona, "The Open Range and the Irrigation Farmer"; Mr. R. L. Fulton, Reno, Nevada, "The Reclamation of the Arid Region"; Mr. William L. Hall, Superintendent of Tree Planting, Bureau of Forestry, Washington, D. C., "Progress in Tree Planting"; Professor A. J. McClatchie, Phœnix, Arizona, "The Eucalypts as American Forest Trees"; Mr. T. P. Lukens, Pasadena, California, "The Reforestration of Watersheds"; Professor L. H. Pammel, Ames, Iowa, "Some Phases of the Growth of the Cultivated Trees in Iowa"; Mr. F. H. Newell, Hydrographer, U. S. Geological Survey, Washington, D. C., "Forests as Reservoirs"; Mr. Gifford Pinchot, Forester, Washington, D. C., "Grazing in the Forest Reserves."

Other speakers are: Professor William R. Dudley, Stanford University, California; Mr. William H. Knight, Los Angeles, California; Mr. George H. Maxwell, Chicago; Edward M. Griffith, Bureau of Forestry, Washington, D. C.

Trees and Civilization. A noteworthy article on forestry under the title of "Trees and Civilization" by Mr. Gifford Pinchot, Chief of the Bureau of Forestry, U. S. Department of Agriculture appeared in the July number of the *World's Work*. Mr. Pinchot's views on the questions of the national forest reserves and their uses, the relation of

forestry to mining, grazing, irrigation, water supply, and the forest policy of the government, are well worth repeating.

We quote the following from this article:

"For nearly three centuries an increasing army has been chopping away at our forests. Yet more than one-third of the area of the United States is classed as woodland—over 1,000,000 square miles. Nor is it the oldest states which have the smallest forests. Of those which border the Atlantic, Delaware is the only one in which the wooded area forms as little as thirty-six per cent. of the entire state. The Gulf states, excluding Texas, are two-thirds wooded; the percentage varies from sixty-two (Louisiana) to seventy-four (Alabama). Even Texas has twenty-four per cent. of woodland. On the other hand, Iowa is only thirteen per cent. wooded, while in North and South Dakota the amount falls to one and three per cent.; Nebraska also has three per cent., and Kansas seven. These are the states of the treeless plains; as we approach the Rockies the timber increases again; no other states have as little as ten per cent. of their area wooded. On the Pacific coast is perhaps the heaviest and finest timber of the world. In a general way, the distribution of forests largely corresponds with that of the rainfall.

"It is almost impossible to bring home to the average man the economic importance of this great national resource. The loss to the country by forest fires, largely preventable, has been estimated at $50,000,000 every year. In regions where wood and water are abundant the tendency is to take them for granted and forget all about them. But without cheap lumber our industrial development would have been seriously retarded. And agriculture demands water. All through great parts of the West the people are coming to see that on forestry and irrigation together depends their future prosperity. Vice-President Roosevelt has called this the greatest internal question of the day.

"As the tide of settlement spread westward immediately before and after the Civil War, the settlers naturally occupied first the level lands wholly or in part devoid of timber, and so easier to cultivate. Later waves of settlement rolled higher around the bases of the mountains, but left even to our time vast stretches of mountainous forests practically untouched. These are the areas which have been taken for national forest reserves. It was seen that upon their preservation depended, to a degree which we have perhaps not yet fully realized, the prosperity of the farming communities lower down. This was the main incentive for the creation of the national forest reserves, a movement begun under President Harrison, continued by President Cleveland, and still in progress of development under President McKinley.

"These reserves have been made from the public lands still in the hands of the government. They number thirty-eight in all, and contain over 46,000,000 acres, or 72,000 square miles.

"An Act of Congress, passed March 3, 1891, provided that the President "may from time to time set apart and reserve * * * any part of the public lands wholly or in part covered with timber or undergrowth," and that "the President shall, by public proclamation, declare the establishment of such reservations and the limits thereof." This clause President Harrison interpreted to be mandatory, an interpretation which succeeding Presidents continued to accept. Within less than thirty days of the passage of the Act he proclaimed the Yellowstone Park Timberland Reserve, containing 1,239,000 acres. One other reserve was made in 1891, and no less than fourteen in 1892 and 1893. The total area reserved under President Harrison was about 13,500,000 acres. President Cleveland's first addition to the list was the Cascade Range Forest Reserve in Oregon, the largest of all the reserves. But it was not until the very end of his term of office that he took a step to which the present widespread public interest in forest matters is chiefly due.

"The relation between forestry and mining finds its best illustration in the Black Hills Reserve of South Dakota.

Great mining enterprises, such as the Homestake Mine, of Lead, require annually vast supplies of cheap timber, if they are profitably to produce gold from their low-grade ores. The wood of the Western Yellow Pine, the only important timber tree of the Black Hills, is used by them for mine timbers and for fuel. It has hitherto been cut with little or no care for its future production, and enormous quantities of it have been wasted. The Bureau of Forestry is just completing a working plan for conservative lumbering for this area, which if carried into execution by trained men, will insure a continuous supply of timber for the future—a condition on which the prosperity of the mines must hereafter depend.

"But the crucial problem to-day in the uses of the reserves is that of sheep grazing. It forced its way to public attention first in the Cascade Forest Reserves in Oregon, and in later years not only in Oregon, but also in Washington, California, Arizona, New Mexico, Utah and Wyoming, and it is less important than the timber question only in parts of Washington, Idaho, Montana, in the Black Hills Forest Reserve of South Dakota, in a single reserve in Arizona, and in Colorado, where the cattle question largely takes its place. To understand its importance it is necessary to remember that on the sheep industry often depends the prosperity of very considerable regions. The gross annual income from this source in eastern Washington amounts to $2,000,000, and about one-third of these sheep depend on the Rainier reserve for summer range. Out of the something less than 42,000,000 sheep in the United States in 1900, over 19,000,000 were in the Rocky Mountain region, and over 5,000,000 more in the Pacific States, worth in all about $68,500,000. In many parts of the West sheep grazing is the chief industry. Herds of from 2,000 to 3,000 head are common, and the business—a highly lucrative one—has a very considerable political importance.

"It is well known that grazing under some circumstances results in serious injury to the forest. It destroys the young growth on which the renewal of the forest depends, sometimes packs the soil hard, and sometimes on mountain slopes, cuts the sod and root-fibers which hold the earth in place. Prolonged over-grazing is fatal not merely to the future of the forest, but, what is of more importance, to its value as a water conserver at the present time. Hence in some parts of the West there has developed a sharp conflict of interests between the communities which depend on reserves for grazing land and the agricultural population of the valleys dependent on them for their water supply.

"The investigations of the Bureau of Forestry establish two things. First, that in certain reserves (including all of those in California) sheep-grazing should be prohibited altogether. Secondly, that in the majority of the reserves limited sheep-grazing may, with proper regulations, be carried on with entire safety to the forest. Such reserves are those of Arizona, New Mexico, Oregon and Washington east of the summit of the Cascades. In such localities it is purely a question of degree. The finest reproduction of the Western Yellow Pine I have ever seen was on a sheep range in Arizona which had been judiciously grazed for over twenty years without a break. On the other hand, as complete desolation as it has ever been my misfortune to look upon I have seen in the same region on an area once famous for the stand of grass. Over-grazing was the sufficient cause. Unrestricted sheep-grazing has this single mitigating character—it destroys itself. The permanency of the grazing industry in the forest reserves depends altogether on its wise and effective regulation by the government.

"The most important of all the functions of the reserves is their yield of water. In the first place the forests with which they are covered, however much or little they may affect the rainfall itself, have a most powerful influence upon the distribution of it after it has fallen. The regulation of streamflow by the forest makes a double saving. Just as a chain is only as strong as its weakest link, so a stream may be valuable for water-power or irrigation

only to the extent of its lowest flow. By holding back the flood waters and adding them to the low-water discharge, the forest increases doubly the supply which can be depended on for economic purposes.

"Agriculture in the West must be developed largely through a system of storage reservoirs. Such reservoirs fail either through the giving way of the dams—a remediable calamity—or through the filling up of the reservoir with silt—a misfortune of a totally different kind. Storage reservoirs whose drainage areas are not protected by forests stand in the greatest danger from this source. Silt is the chief foe to irrigation, and the only remedy is the forest.

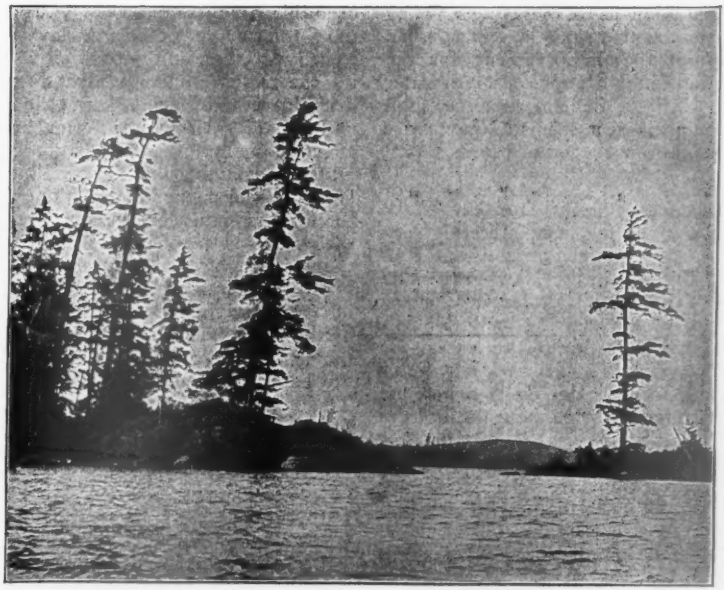
"While sentiment in favor of forest protection first developed in the East, the West is the part of the country now most awake to the importance of maintaining and extending the system of governmental forestry. This is because the prosperity and economic development of great regions are bound up with the cause of forest preservation. There are in this country from seventy to one hundred million acres of land not yet under cultivation which are reclaimable by means of irrigation. This means an increase of at least twenty million souls, and probably more, in the possible population of the country. But permanently successful irrigation involves and demands the preservation of the forests. All the southern California fruit region depends on water supplied by the southern California reserves. Phœnix, Ariz., the center of Salt River Valley, was a few years ago a sage-brush desert. It has now 35,000 inhabitants, with an assessed property valuation of ten million dollars. All this is due to water, which, brought in canals from streams fed mainly from the San Francisco and other Arizona reserves, has turned the desert into a fertile valley covered with ranches and dotted with small towns. Fruit goes from this region to California and ripens a month earlier than that of the latter state. This is only a single example of what irrigation may do, and of the indefinite possibilities of economic service in the government forest reserves.

"There are two measures of policy of vital importance in the West: the extension of the forest reserve system to cover areas whose presevation is essential for any of the reasons I have already noted, and the consolidation of the government forest work under a single bureau. This is now distributed among three unrelated bodies—the General Land Office, which is charged with their administration, the United States Geological Survey, to which falls the duty of mapping and describing them, and the Bureau of Forestry of the United States Department of Agriculture, which is called upon to investigate questions of a scientific and technical nature. The present system is wasteful, unbusinesslike, and in many ways unsatisfactory. In the list of the objections which may be urged against it is this—that it effectually prevents the organization of a government forest service under trained men, and consequently the application of expert skill to forest problems of the greatest delicacy and importance throughout our western country. The time for conservative forestry has fully arrived. The men are being trained in the various forest schools. It only remains to bring the work and the men together."

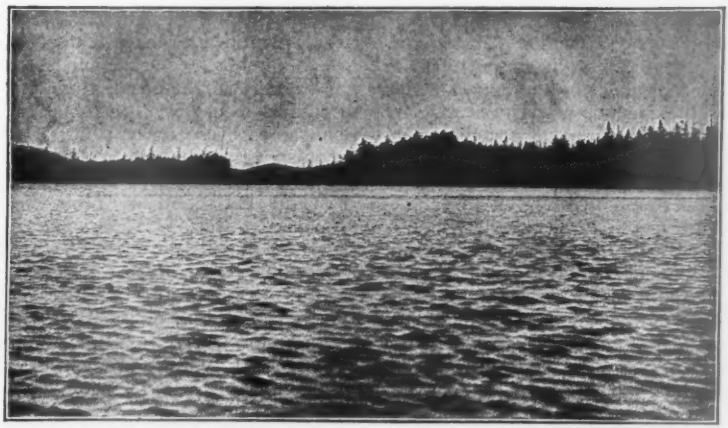
NEWS, NOTES, AND COMMENT.

No Appropriation this year for New York Forests.

Governor Odell, of New York, has vetoed the bill appropriating two hundred thousand dollars for the purchase by the State of forest land, chiefly, within the boundaries of the proposed Adirondack Park. In doing so the Governor says: "In my judgment the time has arrived to consider what the policy of the State is to be with reference to the acquirement of land in the Adirondacks for the forest preserve. Over two millions of dollars have already been expended for that purpose and as yet



SCENE IN WHITNEY PRESERVE, ADIRONDACKS, NEW YORK.



A GENERAL VIEW OF LAKE NEHASANE, ADIRONDACKS, NEW YORK.

no comprehensive plan has been finally determined upon as to the State's policy and the amount that shall be expended in carrying out the improvement for the preservation of the State's forest and water supply. Until a definite scheme shall have been adopted it seems to me unwise to make small appropriations annually."

New Professor at Cornell. Judson Freeman Clark has been recently appointed an assistant Professor of Forestry in the New York State College of Forestry. Professor Clark is a graduate of Ontario Agricultural College, in which institution he served for several years as Resident Master, later studied at Cornell University where he took a master's degree and during the year of 1899–1900 was Fellow in Botany. He received the degree of Ph.D. at the recent commencement. Professor Clark has left for Germany where he will spend six months visiting the principal forests of that country before taking up his new duties at Cornell.

Pine Needle Industry. The utilization of the pine needles of the Western Yellow Pine, botanically *Pinus ponderosa*, is becoming an industry of considerable importance on the Pacific coast, according to Enos Brown, writing in the *Scientific American*. Fifty years ago it was discovered that the extracts and products of the long, slender leaves of the Pine possessed real efficacy in complaints of a pulmonary character. It is claimed that insomnia yields to the influence of the pungent odor, and asthmatics have found a real relief in partaking of the oil and in sleeping upon pillows stuffed with the elastic and fragrant fiber manufactured from the interior substance of the pine leaves. The illimitable forests of Yellow Pine abounding in the state of Oregon, with their accessibility to through lines of transportation, suggested to a German from the forests of Thuringia the transfer of a lucrative business to the Pacific coast. In Germany the leaves never exceed two inches in length, while in Oregon they often exceed thirty inches, and average twenty. In the former country the forest laws are extremely strict and often prohibitive, obliging the maker of the product to use the dried leaves that have fallen to the ground and thus insuring an inferior and less effective quality of goods. In the Western state denuding the Yellow Pine of its leaves has been encouraged, the expert of the forest commission having pronounced the process as beneficial. A tally kept of the weight gathered from a certain number of trees indicated that the crop taken in April weighed 650 pounds while that of the same trees in October yielded 775 pounds. Two crops are gathered yearly, the latter one being always the largest. The leaves of the young trees are preferred, yielding a better quality of oil, it is said; though the fact is doubted. The leaves are stripped from the trees by women and men, who are hired for the purpose, and who are paid twenty-five cents a hundred pounds for the needles. Five hundred pounds is regarded as an average day's work. The leaves are picked into sacks and hurriedly sent to the factory. Exposure to the sun causes the leaves to wilt, and impairs the quality of the product. In picking the thickest bunches of leaves are selected, and the scanty ones neglected. The vast quantity available, so far beyond any present demand, permits the picker to thus discriminate. The factory at which the essence and extracts of the needles are manufactured has a capacity for handling 2,000 pounds of leaves per day; but it is soon to be enlarged to about four times its present size.

In the extraction of pine oil, 2,000 pounds of green leaves are required to produce ten pounds of oil. The process is the ordinary one of distillation. In the manufacture of fiber the leaves pass through a process of steaming, washing, drying, etc., twelve in all, occupying four days. Two qualities are produced, first and second. The first, from which no oil has been distilled, is worth, upon the market, about ten cents per pound. The fiber is elastic, and the staple only little

shorter than the green leaf from which it was made, and with strength sufficient to enable it to be spun and woven into fabrics. Mixed with hair, the fiber makes an excellent material for mattresses or pillows, and repose comes quickly when resting upon them. It is also used as a partial filling for cigars, imparting a flavor not the least disagreeable, and calming to the nerves. The oil extracted gives an agreeable flavor to candies. Toilet soaps are made, strongly impregnated with essential oil of pine needles.

The fiber itself, after curing, looks like a slender shaving of some dark wood, retaining its odor indefinitely. Insects abhor it on that account. It is said that the Oregon factory is the only one in the world outside of Germany.

A Decision on Grazing. We reprint the following account from the Fresno (Cal.) *Republican*, which gives the particulars concerning the trials of several sheepmen for grazing on the Sierra Reserve: "Judge Wellborn, in the United States district court, recently rendered a most important decision, with regard to the control that the executive officers of the United States have over the forest domains.

"It will be remembered that under the direction of the Secretary of the Interior, Charles S. Newhall, superintendent of the forest reserves, last year had a number of sheepmen arrested for poaching on the Sierra reserve. At the same time civil suits were instituted against them to recover damages.

"At the fall term of the federal court in Fresno last November, the prisoners were brought before the court here and at once turned loose, the court maintaining that the department had no right to make encroachment on the reserve a penal offense without act of congress.

"Hearing on the civil cases came up yesterday. The attorneys for the sheepmen in four cases, two against L. A. Blasingame and others and two against John Shipp and others, had entered demurrers to the complaints on two grounds: first, that the State law gave stockmen the right to pasture on the public domain unless the owners of the land took action to shut them off by fencing; second, that the privilege to pasture on public lands has been conceded so long by the United States that it has become a right, and cannot be taken away without special act of congress.

"Judge Wellborn gave an oral opinion on both these points in overruling the demurrer. In first commenting on the claims that the State law permitted the pasturing of the public lands unless it was fenced, he declared that this would not hold, as he construed the term 'public lands' to signify the federal lands lying open on the market for pre-emption, or homestead, and that when the government had reserved certain holdings from pre-emption that they ceased to be 'public lands.' On this ground the State would hold that the forest reserves were the private property of the national government in the same way that other land is held privately, and could be defended from trespass.

"Secondly, the judge held that it could never be considered whatever the State law might be with regard to the holding of public land and the right of pasture, that the federal government could be deprived of its control of the land or the right to protect it in the federal courts.

"As to the claim that the graziers had a right from long presence to go upon the federal domain until Congress should decree otherwise, the Court held that Congress had never given any such right; that it had been exercised through many years through the suffrance of the Executive Department of the Government, and the Executive Department could take it away at any time, should the public interest and the purpose of forming the reserve require it. The Court therefore overruled the demurrer, and gave the defendants thirty days in which to answer the complaints.

"District Attorney Flint in speaking about Judge Wellborn's decision afterward, stated that this decided the law fully and that all that would be required now would be to show the facts in each case.

"He said that this would give the federal authorities absolute control of the situation. Not only could suits be brought to recover damages in case of trespass, but if any stock men threaten to go upon the reserves or indicate their intention in any way, he will bring injunction proceedings to bear upon them, which will effectually prevent damage.

"Superintendent Newhall stated yesterday that this ruling gave him his first substantial ground to stand upon, in working under the direction of the Secretary of the Interior. He said that the forest rangers, who will soon be sent out, will have strict instructions as to trespassers, and will be given power to employ force in keeping out the sheep. The importance of doing this to prevent damage to the forest growth becomes more apparent every year, and it may also be necessary to restrict the use of the ranges for other stock as well as sheep."

New Forest Association. At Connersville, Ind., an organization was recently formed called the International Society of Arboriculture, with something over 300 members, representing thirty States and several foreign countries.

The purpose of the association is to introduce judicious methods in dealing with forests and woodlands; to advance and advocate a public interest in the subject; to promote the afforestation of unproductive lands; to encourage the planting and care of shade trees in parks, public and private grounds, and along streets and highways; to inspire an interest in our remaining forests and groves of ancient trees and to seek their preservation; to supply information to railway officials in regard to timber culture for railway uses, and to incite railway and other corporations to plant trees for economic purposes.

John P. Brown, of Connersville, Ind., who was chosen Secretary of the society, made the following report of the year's work by the late Indiana Forestry Association

"One and one-half million forest trees have been planted through the influence of the association. Fifty railway companies have become interested in forestry, some of which have planted 60,000 to 100,000 trees for cross ties. Two hundred and fifty pounds of forest tree seeds, enough for 2,000,000 trees, have been distributed this spring. Some of these have gone to Australia and New Zealand. Two very important laws have been enacted by the Indiana Legislature through our influence. Thirty-eight thousand booklets and circulars of instruction in practical forestry have been printed and distributed. Many requests for these publications have come from abroad.

"The literature sent out by the society has changed public opinion very materially in many localities."

Indiana State Forest Board. Governor Durbin, of Indiana, has appointed the men who are to compose the Indiana Forest Board, which was authorized by an act passed at the recent session of the legislature. Following are the men selected:

Professor William H. Freeman, of Wabash, appointed secretary of the board. Prof. Freeman was chosen because of his practical knowledge of forestry.

Prof. Stanley S. Coulter, of the faculty of Purdue University, Lafayette.

Finlay P. Carson, of Michigan City, appointed as the representative of the Indiana Retail Lumber Dealers' Association.

John Cochrane, of Indianapolis, representing practical woodworkers.

Albert Lieber, of Indianapolis, representing the Indiana Forestry Association.

RECENT PUBLICATIONS.

Proposed Scheme of Coöperation in Forest Tree Planting in Manitoba and Northwestern Territories. Being Circulars 1 and 2 of the Forestry Branch, Department of the Interior, Canada.

These circulars contain suggestions: No. 1 on the preparation of soil for tree culture, and in No. 2 there is a copy of the tree planting agreement through which settlers may secure the assistance of the government. This plan of government coöperation includes the main features of the plan now in operation in the United States.